MS Dissertation in Engineering

Risk-management in E-government PPP projects. The case of Uzbekistan

전자정부 PPP 프로젝트 위험 관리. 우즈베키스탄의 사례를 중심으로

August 2018

Graduate School of Seoul National University

Technology Management, Economics, and Policy

Program

Abror Islomiddin o'g'li Tursunov

Risk-management in E-government PPP projects. The case of Uzbekistan

지도 교수 황 준석

이 논문을 공학석사 학위논문으로 제출함

2018 년 8 월

서울대학교 대학원

협동과정 기술경영경제정책전공

Abror Islomiddin o'g'li Tursunov

아브로 의 석사학위논문을 인준함

2018 년 8 월

위 원 장 Jorn Almann (인)

부위원장 황준석 (인)

위 원 윤현영 (인)

Abstract

Risk-management in E-government PPP projects. The case of Uzbekistan

Abror Islomiddin o'g'li Tursunov

Technology Management, Economics, and Policy Program

College of Engineering

Seoul National University

The purpose of this study is to investigate the possible risks inherent in e-government projects in Uzbekistan. To identify these possible risks, allocate them to the private versus public sectors, and ultimately mitigate them, this study assesses both the private and public sectors that relate to e-government projects.

This study leverages Delphi techniques to collect data from respondents in the public and private sectors. In the first-round survey, about 64% of respondents responded in a complete manner; for the second-round survey, this

number was about 60%. The data were crafted by using the formula of Tastle and Wierman (2005), to evaluate consensus measurement.

This study's findings indicate that no respondents from either the private or public sectors perceived of any catastrophic-level risk; rather, most of the risks were evaluated as being at a critical level. Concerning risk allocation, none was allocated solely to the private sector; rather, they were evenly shared between the private and public sectors. Concerning mitigation measures, most of them were rated as being suitable, while only a few were considered neutral.

Therefore, based on the results gathered since project completion, it can be said that construction cost overruns, inflation, and operation cost overruns are perceived as having a relatively high risk impact. As a result, the suggestion is made that the government monitor and follow up on these matters. Furthermore, according to the results presented in this study's risk allocation matrix, the suggestion is also made that the private and public sectors form a partnership so as to mitigate risk.

Keywords: Risk management, Risk allocation, Risk mitigation strategies, Delphi method, Public–private partnership (PPP), E-government projects, Uzbekistan.

Student number: 2015-22143

Contents

List of Figures and Tables

Chapter 1 Introduction

This chapter presents an overview of the research, and also introduces the concept of public–private partnerships (PPPs) in e-government. It touches upon the research proposal and questions, and finally ends with the research design.

1.1 General Introduction

E-government systems have been popular in many developing countries, largely because their use can help improve the productivity of governments and the quality of the services they provide. However, implementing an e-government system requires considerable financial resources, as well as expert technical skills—both of which tend to be lacking in the developing world. PPPs are emerging as solutions by which to counter these kinds of issues.

Within the context of e-government, a PPP can be considered a contractual agreement between the private and public sectors to deliver electronic public services. As part of this agreement, the private sector should invest its own resources—for example, financial and technological resources—in order to save budget money, transfer new technologies, share risk, and reduce political influence in the economy. The goals that can be achieved by leveraging PPP to deliver e-government projects are as follows.

1) Attract the experience of private sector entities, as well as the private sector's technologies and culture of innovation. to design electronic public services and networks
2) Attract private investment in order to balance public funds
3) Implement commercial services based on private sector customer service expertise and marketing channels
4) Derive benefits from the creativity found in the private sector

There is no doubt that e-government can offer society enormous benefits. To successfully implement e-government projects and find feasible solutions, we should clarify those benefits that derive from the public sector's partnership with the private sector. The benefits that are expected to arise from PPP in implementing e-government projects are as follows.

1) World-standard e-government applications, infrastructure, and services, brought about by investments from the private sector
2) The use of advanced technologies and engineering systems in designing e-government projects
3) The achievement of high-level outcomes, especially in terms of better service delivery and higher client satisfaction

In clarifying the benefits that could derive from a PPP, various real-world examples of failed PPP projects arise. There are reasons for these failures. Many developing countries have sought to establish long-term PPP projects within a too-short timeframe, or—on account of the public sector making poor decisions—there is a mismatch of partners. To make it clear, PPP projects come with a certain amount of risk that is not expected from the public side. In many cases, when the private sector implements projects, it cares only about the benefits it will derive, and it tries to preclude those risks that are likely to be costly for them.

Therefore, this study ultimately looks to assist in managing risks inherent in PPP projects, as found in e-government. It identifies those risks, allocates them to the public or private sector, and mitigates those risks by proposing strategies within a risk-management process, all in an effort to remove barriers that can arise when implementing an e-government system.

This study is unique, as it is the first to examine risk management in e-government PPPs in the case of Uzbekistan. Additionally, most previous studies have focused on energy, motorway, railway, tunnel, and bridge PPP projects. This study offers benefits to Uzbekistan in terms of its information and communications technology (ICT) sector, as the Uzbek government has a

unique context; as such, this study's findings may help its policy-makers overcome obstacles by helping them better manage the risks inherent in future PPP projects that relate to e-government.

1.2 Purpose of the Research

Today, while the use of PPPs in e-government is prevalent among developed countries, it is a relatively new approach among developing countries. To consider the topic of PPP in e-government within developing economies—especially Uzbekistan—there was an attempt to address the topic of risk management, by conducting a survey of government officials, experts in the private sector, and some academics and consultants. This study aims to examine PPP projects in e-government in Uzbekistan, in order to identify and mitigate risks. Ultimately, the endpoint is to assist the country in successfully implementing and developing an e-government system, and in the course of doing so, it has the following objectives.

The first objective of this study pertains to the five categories of risk in e-government PPP projects, and determining those specific risk factors that may significantly affect the successful implementation of e-government PPPs in Uzbekistan. As no study has offered a list of specific risks inherent in e-

government PPP projects, the current study does look to pinpoint the general risk factors that may occur in any kind of PPP project.

The second objective of this research is to analyze e-government PPPs, the probability of risk occurrence, and the impact of those risks on those projects (Carbonara, Costantino, Gunnigan, & Pellegrino, 2015). This objective was accomplished by evaluating those significant risks that are already known, and understanding experts' preferences in light of the relevance of those risks. Thus, this study aims to determine the relevance of perceived risk factors, in order to ameliorate those obstacles to implementing e-government projects.

The third objective of this thesis is to speculate on risk allocation, and which party within the partnership is best suited to handling any given risk. In most cases, when expectations following the completion of a PPP project have not been met, the parties involved tend to blame each other, to avoid responsibility; often, this occurs because risks had not been clearly allocated. This study therefore looks to underscore the importance of risk allocation. Second, it will look also to confirm the accuracy of the risk allocation analysis herein, by conducting a survey of experts.

The fourth objective of this research is to provide policy-makers and experts with overall risk mitigation strategies, in order to achieve the successful

implementation of e-government PPP projects in Uzbekistan. To provide accurate strategies, mitigation strategies were drawn from the literature; to determine their appropriateness, experts were asked to rate them in terms of risk mitigation.

The final objective of this study is to offer Uzbek policy-makers both implications and policy suggestions, so that they can design strategies that will ensure the successful implementation of e-government projects by partnering with private sectors.

Based on the aforementioned objectives, this research is guided by the following research questions.

Q1. Which types of risk are more relevant to e-government PPP projects?

Q2. What are the preferences of experts in terms of allocating risk between Uzbekistan's public and private sectors?

Q3. How suitable are the given strategies to mitigating risk?

Q4. What kind of policy implications can be offered to the Uzbek government, so that it may achieve optimal risk management en route to delivering PPP projects relating to e-government?

This study's overarching purpose is to assist in undertaking a risk assessment of e-government projects in Uzbekistan. Our goal is to provide

policy-makers with policy implications, by defining major e-government PPP risks, allocating them to the private or public sector, and—by using the Delphi method for primary data collection—offering risk-mitigation strategies with respect to e-government. Further, by addressing the aforementioned research objectives and questions, and by using the Delphi method to analyze them, this study aims to inform with regards to risk management, given that Uzbekistan is in the early stages of implementing an e-government system.

1.3 Research Design

This graduate thesis is organized into five chapters, as shown in Figure 1. Chapter 1 provides an overview of the research; it also includes a research proposal that covers research objectives, the research questions that are posed. Finally, Chapter 1 discusses this study's structure.

Chapter 2 discusses the research background and describes the problems addressed by this study. It discusses the status quo of both the public and private sectors, and then explores each category of risk inherent to them. Chapter 2 concludes by discussing problems described in the study.

The next section, "Public–Private Partnerships in E-Government," reviews the relevant literature on risk management in PPPs, including e-governments; methodologies as found in the literature are investigated there. Chapter 4

presents the research methodology used herein, as well as the design of the survey. Delphi findings are then presented and discussed. The final chapter offers policy suggestions, as well as concluding remarks.

Chapter 2 Research Background and Problem Description

This chapter covers the research background of this study, gives an overview of the public sector (i.e., the government of Uzbekistan) and discusses its partnerships with the main private parties (i.e., South Korea, the Asian Development Bank [ADB], and the World Bank [WB]). It then explores the risk categories pertaining to PPP and discusses research problems.

2.1 Risks Inherent in E-government PPP Projects

Those countries that strongly insist upon the implementation of e-government systems have worked to develop electronic services, chiefly to better deliver information and services to businesses, the public, and government organizations (Choudhari, Banwet, & Gupta, 2007). In terms of achieving this goal, developing countries face several barriers, such as inadequate financial resources and a lack of advanced technologies (Kumaraswamy et al., 2010). Furthermore, even when those resources are sourced and applied, implementations of e-government projects have often failed.

Heeks (2003) states that in developing countries, only 15% of e-government projects are successfully implemented, and that overall, 50% of them experience partial failure. Thus, 35% of all projects are complete failures,

thus indicating that these countries face many challenges in implementing e-government systems. Studies indicate that billions of dollars in financial resources have been wasted on account of project cancellations, late completions, and cost overruns. Time-to-completion risk has been seen more in than 50% of the information technology (IT) projects, while around one-third of them are canceled (Choudhari et al., 2007). To sidestep such issues and potential problems, the governments of many developing countries have been encouraging the involvement of the foreign private sector in implementing infrastructure projects.

This study aims to identify key risks inherent in e-government projects in Uzbekistan and offer best management practices, in order to help preclude project failure. The recognition and management of those risks inherent in e-government PPPs can be very effective. Doing so can improve the chances of successful project implementation—after all, the first steps in managing risk are to identify and classify risks.

Previous studies indicate that different authors have classified risks into different categories. According to Tchankova (2002), risks can be categorized into seven groups, as follows: i) physical, ii) social, iii) political, iv) operational, v) economic, vi) legal, and vii) cognitive environment. Moreover, Baccarini,

Salm, and Love (2004) also offer seven groupings: i) commercial and legal relationships, ii) economic circumstances, iii) human behavior, iv) political circumstances, v) technology and technical issues, vi) management activities and control, and vii) individual activities. Evangelidis (2005), furthermore, divides them into five categories: i) social, ii) technical, iii) economic, iv) political, and v) security. This thesis proposes the use of five categories of risk: i) political and legal risks, ii) construction risks, iii) operation and performance risks, iv) economic and financial risks, and v) natural risks. Let us look at each of these five categories, in turn.

2.1.1 Political and Legal Risks

Political and legal risks, as their names imply, relate to political and legal issues; they may cause a revenue decrease in the private sector or create project cost overruns. These risks typically emerge because of certain government actions, including legislation changes, changes in tax regulation or nationalization/expropriation, and poor public decision-making processes. Changes in government can also generate political or legal risks, as they engender a lack of consistency among the priorities that affect private investors (Medda, 2007).

i) Legislation changes

The risk inherent in legislation changes occurs when the government changes its regulations and policies or establishes a new one inconsistently, which can affect a project by increasing its cost or reducing its revenue (Chan, Yeung, Yu, Wang, & Ke, 2010). Owing to the poor legal frameworks found in many developing countries, the level of risk inherent in legislation changes in e-government systems is high. Most of the studies in the literature show that legislation changes should be shared between parties (Ke, Wang, Chan, & Lam, 2010). Governments should provide compensation if this risk occurs and affects the investment (Kumaraswamy et al., 2010).

ii) Changes in tax regulation

Changes in tax regulation come about in the same manner as legislation changes, and they have the same impact on project implementation (Kumaraswamy et al., 2010). To mitigate this risk, the government should offer tax holidays, tax relief and exemptions, and the relaxation of taxes on imported materials and equipment. For construction companies in particular, changes in taxes can lead to decreases in revenue.

iii) Changes in nationalization/expropriation

The government of a country in which projects are implemented may change its decisions so as to take ownership of those projects. Most countries have the

right to expropriate any properties located on their land; if this occurs, the private sector requires financial compensation for undertaking projects, as per international expropriation laws. Sometimes, it can take longer for this compensation to be paid in a developing country than in a developed one, on account of a lack of financial resources. Ke et al. (2010) defines this risk as relating to unreasonable compensation accruing from government seizure of a project from the private sector.

iv) Poor public decision-making processes

In most developing countries, government officers pay more attention to short-term achievements or their own careers; naturally, this can affect decision-making processes with regards to projects. Moreover, risk arises whenever those officers make decisions while holding inadequate PPP experience (Ke et al., 2010).

2.1.2 Construction Risks

Construction risks are risks that occur during the construction of projects, and they generally pertain to time to completion, construction cost overruns, and the quality of finished work. According to Delmon (2011), the risks in this category are the costliest ones, and they should be allocated to the private sector that implements the project.

i) Time to completion

Project completion represents the end of implementation. In practice, project companies want to start implementing PPP-based projects as soon as possible, so as to complete them and improve their return revenues as soon as possible. In contrast, funding organizations and offtake purchasers often try to postpone completion, so as to extend the operational time horizon and benefit further from the projects. Therefore, time-to-completion risks are less likely to occur when both parties have an interest in completion, and both are likely to derive benefits from that completion. This risk should be allocated to the private sector, as it can generally handle it better than the public sector (Ke et al., 2010).

ii) Construction cost overruns

Changes in costs require an additional payment from one of the parties participating in project implementation. Such cost changes may occur due to changes in law and regulations, the use of an insufficient workforce or inappropriate technologies, and delays in approvals. In PPP-type contracts, these risks are very much allocated to the private sector, including investors and project companies (Ng & Loosemore, 2007). Most studies show that the private sector can best handle this risk (Ke et al., 2010).

iii) Quality of finished work

After implementation, all work undergoes an assessment, to ensure that it is of a satisfactory quality. E-government projects in PPP must be able to deliver electronic services in the manner expected prior to project implementation; any shortfalls in this area will incur additional costs and resources, in order to fulfill project expectations. To mitigate this risk, inspectors should be tasked with monitoring quality, and the construction companies should be compelled by law to bear the related expenditures. In the literature, this risk is typically allocated to the private sector (Ke et al., 2010), but the government needs to provide supports or guarantees in the form of additional funds (Kumaraswamy et al., 2010).

2.1.3 Operation and Performance Risks

Operation cost overruns, a lack of supporting infrastructure, and both technology and design risks are variously categorized in the literature. As a result, for the current case, we changed the groupings several times before and while the surveys were conducted. According to Delmon (2011), performance risks occur when projects overshoot projected maintenance costs or fail to satisfy debt repayments to the private companies investing in the project. Projects should be operated in the above manner, to achieve feasible returns; otherwise, operation costs will increase. Based on the literature review and the

work of Delmon (2011), this study groups the following risks as operation and performance risks.

i) Operation cost overruns

Operation costs overrun when projects have been insufficiently planned or improperly measured. Most studies allocate this risk to the private sector. In addressing this risk, mitigation strategies include the enactment of maintenance bonds and reserves, or fixed prices and timeframes.

ii) Lack of supporting infrastructure

This type of risk arises in the absence of supporting facilities (Chan et al., 2010). Kumaraswamy et al. (2010) suggest that the private sector provide both short and long-term infrastructure programs to determine the infrastructure facilities that need to be developed. Prior to implementation and in the case of infrastructure, projects should be investigated by local experts. To provide a country's citizens with satisfactory access to electronic services, e-government projects require the provision of supportive telecommunication infrastructure, such as high-speed internet and internet access in all parts of the country.

iii) Technology risk

This risk relates to the use of inappropriate technologies that do not meet project requirements (Ke et al., 2010). The government needs to share this risk in order

to monitor the project's execution, and construction supervision needs to take into consideration technological design. Moreover, a comprehensive analysis should be carried out before initiating the design of project implementation plans.

iv) Design risk

Design risk should also be considered, to meet the requirements that help ensure high-quality work. To mitigate design risk, an independent design-checker should be brought in, and he or she should assess quality with respect to design approval, design development, and the work itself (Kumaraswamy et al., 2010). An e-government system should be well designed from the perspective of participants across the country. During the design phase, both the private and public sectors should consider and address cultural issues, as many project companies and actors within the public sector differ widely not only in terms of culture, but also in terms of education, religion, and the so-called digital divide.

2.1.4 Economic and Financial Risks

Economic and financial risks stem from uncertainties regarding economic growth, exchange rates, and inflation rates (Medda, 2007). In terms of this risk category, the current study considers inflation, interest rate fluctuation, and foreign exchange rate risks. (Ng and Loosemore (2007) categorize these as

financial-type risks, while Chan et al. (2010), Kumaraswamy et al. (2010), and Ke et al. (2010) each consider them economic-type risks.) Let us look at each of these specific types of risk, in turn.

i) Inflation

Chan et al. (2010) describe inflation occurring when there is an increase in outputs alongside a decrease in the value of the local currency—a set of circumstances that can later cause a project cost overrun. It can also lead to payment erosion in the project finances. To mitigate this risk, the project implementers require from the government a guarantee against a high inflation level, or compensation should one occur. In this area, most studies recommend risk-sharing between the public and private sectors.

ii) Interest rate fluctuation

This risk arises when a country's local economy and its banking system are immature (Chan et al., 2010). Interest rate fluctuation can lead to project failure, and so governments should provide guarantees against high interest rates, in order to attract foreign investment. For obvious reasons, project companies look for fixed-rate debt. Ng and Loosemore (2007) and Wang and Tiong (2000) each prefer to allocate this risk to the private sector, whereas Bing, Akintoye,

Edwards, and Hardcastle (2005) suggest that the public and private sectors share it.

iii) Foreign exchange fluctuation

This risk relates to local currencies that freely fluctuate relative to other currencies; such conditions can cause divergence between the currency of the revenue and the debt. This happens when the value of the local currency decreases and, as a result, debt incurred by the project increases. In most developing economies, the foreign exchange rate "floats" due to a lack of foreign trade; indeed, this phenomenon is frequently seen. In such cases, the contractor companies will require exchange rate guarantees to ensure the project will remain affordable.

2.1.5 Natural Risks

This risk category, unlike the others, is associated with nature. Mitigation of this risk requires protection; otherwise, it can have significant impacts on the project itself. This category covers force majeure and environmental risks. Ng and Loosemore (2007) include force majeure risk in their financial risk group, while Ke et al. categorizes (2010) it with "other" risks. Both force majeure and environmental risks are grouped in the natural risk category by Roumboutsos and Anagnostopoulos (2008) and Chan et al. (2010).

i) Force majeure

These risks relate to issues that cannot be avoided, as they are not typical risks *per se* (Chan et al., 2010). These risks can arise from floods, earthquakes, storms, riots, fires, and strikes, and they should be shared equally by the private and public sectors (Ng & Loosemore, 2007). In such circumstances, neither party could, on its own, control the situation (Ke et al., 2010). The occurrence of the risk is so high in infrastructure projects (including e-government PPPs) because implementation requires the use of so much ICT. According to one of the experts surveyed for this study, before such catastrophes happen, the responsible organizations are typically warned by weather forecasters. According to Delmon (2011), force majeure events can be categorized as either natural or political events.

ii) Environmental risks

Ke et al. (2010) state that environmental risks happen when narrow environment protection regulations are established, as this can lead to weakened environmental commitment from the implementation side. This risk can have a considerable impact on projects, as it may increase project costs or delay completion. Therefore, this risk should be addressed so as to attract investment and provide conditions conducive to meeting deadlines and quality goals.

Moreover, all kinds of projects significantly affect the environment, as their implementation frequently demands the destruction of nature; many of them continue to have an impact post-implementation (e.g., environmental hazards).

2.2 Overview of Private Partners

2.2.1 Partnership with South Korea

Uzbekistan, a country rich in natural resources and landlocked in Central Asia, has a relatively large population (31.5 million). Over the last decade, it has experienced stable development and poverty reduction, mainly on account of its focus on investments in agriculture, education, infrastructure, and health care.

Since the creation of a partnership between Uzbekistan and South Korea upon the former achieving independence, there have been more than 10 summits between the heads of these two countries. During that time, long-term projects in a number of areas have been executed, leading to improvements in trade, infrastructure, culture, and many other sectors in Uzbekistan.

On the other hand, the Uzbek government has been supporting South Korea with respect to denuclearization, by establishing a nuclear-free zone in Central Asia. The partnership between these two countries has given rise to solid benefits for both of them, especially in terms of globalization.

During the 2007–2011 period, South Korea invested approximately US$67 million in Uzbekistan, mainly in the areas of education, energy, health, and public administration (Table 1). As we can see, the South Korean government gave to Uzbekistan a US$41-million grant, which showed an increase comparing to loans by years.

Table 1: South Korea's official development assistance to Uzbekistan (2007–2011)

Year	2007	2008	2009	2010	2011	Total
Loans:						
Commitments	-	-	10.00	-	15.00	25.00
Disbursements	-2.04	-2.67	-2.19	20.35	12.96	26.41
Grants	5.26	6.66	8.09	11.86	9.03	40.90
Total	3.22	3.99	15.90	32.21	36.99	92.31

Unit: US$ millions, net disbursements. Sources: EDCF and KOICA statistics.[1]

One of the largest PPP projects to be executed in Uzbekistan was the Ustyurt gas–chemical complex, which cost US$4 billion; for this project, KOGAS, Lotte Chemical, and STX Corporation were Uzbekistan's private

1 http://www.koica.go.kr/dev/download.jsp?strFileSavePath=/ICSFiles/afieldfile/2013/07/10/1_11.pdf&strFileName=%BF%EC%C1%EE%BA%A3%C5%B0%BD%BA%C5%BA.pdf.

sector partners. As a point of reference, the total amount of South Korean investment in Uzbekistan between 2004 and 2014 reached US$6 billion.

Logistics, another noteworthy area of cooperation between the two countries, have also been carried out with the world's largest air-cargo carrier, Korean Air. The International Logistic Center was established at the Navoi Airport, which is located next to the Navoi Free Industrial Economic Zone.

Today, South Korea is an essential partner with Uzbekistan in a number of important areas, such as automobile manufacturing, mining, oil and gas, petrochemicals, energy-saving technologies, textiles, agriculture, construction, medicine, education, sport, tourism, and ICT. This cooperation has manifested in the establishment of more than 400 enterprises in these fields.

2.2.2 International Financial Institutions

Cooperation with the Asian Development Bank:

The ADB aims to reduce poverty in Asia by making economic and environmental improvements in the region. The ADB's main focus in doing so has been investing—in the forms of loans, grants, and information-sharing—in the areas of infrastructure, health care, public administration, and education.

Today, the ADB has 48 Asian members, and another 19 members from outside Asia. Japan and the United States each hold the highest proportion of

funds (i.e., more than 15% each), while China, India, and Australia each hold around 6%. The ADB has also been aiming to reduce climate change and manage natural resources in its member nations. Most of its investments focus on education, climate change, the financial sector, infrastructure, and private sector development within the region.

Uzbekistan joined the ADB in 1995, and since then, the Uzbek government has accepted US$5.1 billion in the form of a loan and US$64.9 million in the form of a grant. According to the ADB website[2], it has 122 projects in Uzbekistan; among them, 55 have been approved and are currently active, 59 are currently inactive, seven projects are proposed, and a water resources management project (first initiated on November 27, 2012) was terminated.

Table 2: Loans and grants received by Uzbekistan from the Asian Development Bank

Sector	No.	Total amount (US$ millions)	% of total
Agriculture, natural resources, and rural development	28	581.74	11.15
Education	21	296.93	5.69

[2] https://www.adb.org/projects/country/uzb

Energy	22	1,541.20	29.55
Finance	23	629.94	12.08
Health	4	41.60	0.80
Industry	3	175.68	3.37
Public sector management	15	29.73	0.57
Transportation	28	1,329.85	25.50
Water, other urban infrastructure and services	21	589.12	11.29
Total	165	5,215.79	100.00

Source: ADB Projects in Uzbekistan[3]

Cooperation with the World Bank:

As a financial institution, the WB offers loans and grants to developing economies, ultimately with the aim of reducing poverty. Uzbekistan has been a WB member since 1992, and the WB looks to support improvements in the lives of its population, principally by modernizing its public sector and infrastructure.

To date, there have been 48 WB projects in Uzbekistan, with the first being completed in 1993. Of those, 22 are currently active, 18 have been completed, seven were discontinued, and one is a pipeline project. Since 1995, the WB has provided Uzbekistan with credits and loans totaling US$2.6 billion, which has

[3] https://www.adb.org/projects/country/uzb

been earmarked for 28 projects in privatization, financial sector development, the modernization of agriculture and the power industry, and improvements to social infrastructure, health care, and education.

Today, Uzbekistan's total liabilities to the WB exceed US$6 billion. The main sectors to which this money has been directed relate to central government administration (12 projects); irrigation and drainage (10); health (9); the general agriculture, fishing and forestry sector, and agriculture extension and research (5); water supply (4); and the agro industry, marketing and trade (4). Two other WB projects are IT and ICT-related projects.[4]

2.2.3 Cooperation between South Korean and International Financial Partners in the Development of Uzbekistan

Furthermore, there has been considerable cooperation between South Korea's and Uzbekistan's international financial partners, from the perspective of developing and implementing PPP-type e-government projects. The Korean International Cooperation Agency (KOICA), the National Information Society Agency (NIA), the Korea Institute of Public Administration (KIPA), the Korea Information Society Development Institute (KISDI), and LG CNS (South Korea) are the main South Korean participants; the financial institutions

[4] http://www.worldbank.org/en/country/uzbekistan/projects.

involved include the WB, the ADB, and the United Nations Development Programme (UNDP) ("Electronic Government" System Development Center[5]). These partnerships have given rise to the following e-government PPP projects.

a) KOICA project (2016–2018)

To increase IT literacy in the Uzbek population, special IT centers and programs have been established by KOICA in locations throughout all of Uzbekistan's territories. The original project timeframe is from 2016 to 2018, at projected costs exceeding US$6.17 million. Its main aim is to design computer literacy centers that contain technical equipment, and to offer training by South Korean experts.

b) Knowledge-sharing program (2014–2016)

This project began in 2014, with plans to conclude it in 2016. The main target of this project was to establish special management institutions to assist in the development of e-government. It was granted almost US$1 million. South Korea shared its relevant expertise and know-how by taking part in this project.

c) WB project to improve the business environment (2015–2017)

[5] http://www.egovernment.uz/en/about_center/international_cooperation/.

This joint project sought to develop the legal and technical skills of business experts involved in e-government by offering them special courses. Its project cost was US$1 million, and it was completed by the end of 2017.

d) UNDP project to develop public service delivery (2014–2016)

This e-government development project also cost US$1 million, one-half of which was financed by the Uzbek government. The aim of this project was to improve e-government systems for delivering public services.

e) ADB project in e-government for effective public management (2015–2017)

The main focus of this project was to develop effective technical public management relating to e-government. The project cost was US$1.5 million.

2.3 Barriers to E-government Initiatives

In Uzbekistan, e-government initiatives face great barriers in terms of ICT infrastructure and deployment (Rakhmanov, 2009). The government crafted a first master plan for the 2003–2010 period, to develop and implement its e-government system. Almost US$600 million was invested in infrastructure, until 2007; however, due to the preference among the population to use paper over e-documents, there was a general lack of interest in e-services. This

preference persists, despite the fact that the use of paper-based systems sometimes leads to document loss or to process delays.

To preclude the use of paper-based systems and achieve the electronic delivery of services, government organizations in Uzbekistan have continued to invest in e-government projects. In 2012, the Uzbek government introduced a new plan to develop and implement e-government, with 28 projects and tasks slated for the 2014–2020 period. The main aim in doing so was to establish national databases, which would in turn facilitate the creation of a complex information system (IS) for e-procurement, taxation, customs, licenses, budgets, education, housing utilities, justice, and pension programs. In addition, there are plans until 2020 to develop laws on e-government and create regional centers that support e-government users. The Uzbek government selected South Korea as a strategic partner to implement and develop e-government.

According to the United Nations' E-Government Development Index, Uzbekistan continues to show a ranking that does not align with the expectations in 2018 (no. 80), compared to its ranking in 2005 (no. 79). Although significant efforts have been made to develop e-government, these results point to the need for deep study or analysis, by investigating the preferences of those policy-makers who have been responsible for

implementing e-government projects in Uzbekistan. By doing so, barriers can be identified, mistakes can be learned from, and failures are less likely to be repeated.

Based on the described problem, the current study looks to examine risk assessments and management in e-government projects by analyzing the preferences of both the public and private sectors in Uzbekistan; outcomes will include a listing of probable risks, allocation of those risks to either the private or public sector, and the preparation of mitigation strategies. In the course of this study, we generate a guideline by which to resolve barriers to designing and implementing effective e-government projects in Uzbekistan.

Chapter 3 Literature Review

This chapter undertakes a review of the literature that relates to e-government, PPPs in e-government, and research methodologies. The first section defines "e-government," and also classifies the types of e-government use. The second section views the literature on PPPs in e-government. Moreover, the benefits of using the PPP model in implementing an e-government system are also presented, to demonstrate its importance. The third and final section of this chapter addresses how other researchers have used the Delphi methodology in their respective studies.

3.1 Definitions of "E-government"

Although the first publications on e-government appeared in the 1990s, interest in this topic was muted until the 2000s. Despite its extensive use worldwide, there are currently various definitions of "e-government." While some scholars suggest it is the use of the internet to deliver public services, information, and democracy (West, 2000), or that it is about citizens gaining internet-assisted access to online services offered by the authorities.

While the definition of "e-government" has typically related to the use of ICT to deliver public services—as suggested by UN surveys in the early 2000s—today, the definition has been extended so as to encapsulate workflow

rationalization and integration and data and information management. In short, e-government is now also about the extension of communication channels to engage and empower citizens (Al-Khouri, 2014). Although definitions in the early 2000s tended to concern the use of IT or ICT in the government, later authors went on to say that e-government has a broader definition that extends beyond those areas (de Oliveira Almeida & Zouain, 2015).

Briefly, e-government systems can help governments more effectively deliver their services to the population, and facilitate seamless interactions with business and industry; furthermore, management of these efforts is both efficient and effective. Ultimately, the benefits of using e-government systems will include less corruption, higher transparency, time savings, cost reductions, and higher revenues.

By undertaking classification, two types of research groups can be seen. One of these can be further broken down in terms of three kinds of activities—namely, G2C, G2B and G2G activities. The other group comprises four kinds of activities, including government to employee activities, at three several typess.

To better understand the benefits of using an e-government system, it essential to know the reasons why a government uses one—and to determine

those reasons, it is important to understand the five types of e-government use, as follows.

1) General information use
2) Transactional service use
3) Searching information related to government policies
4) Use in the decision-making process
5) Create policies, information, and services, together with governments and other citizens

Among these, the transactional and general information uses are most frequently utilized. By virtue of the latest e-government technologies, it is becoming easier to enhance businesses and connect them to the government. By reducing administrative time and costs, e-government can assist in delivering to workers more effective working conditions.

3.2 Literature Review: Methodologies

This method is popular for investigating managerial decision-making in the context of ISs. Okoli and Pawlowski (2004) undertook research on the Delphi method, to guide them in the selection of appropriate experts; they also focused on e-commerce in the case of Sub-Saharan Africa. They first compared the Delphi study to traditional survey methods, by presenting the strengths and

weaknesses of both. They then presented a procedure by which to select experts. In their view, the target size of an expert panel for purposes of conducting a survey should be between 10 and 18.

Another study on methodology that provides guidance for graduate-level research is that of Skulmoski, Hartman, and Krahn (2007). Similar to the aforementioned study, these authors also focused on the IS and IT sectors. Moreover, they summarized non-IS/IT, IS/IT, and graduate-level research results, to demonstrate the flexibility of the given methodology. In short, this study undertook a deep investigation of the number of experts and rounds, and the consensus level needed to meet the requirements of the Delphi method.

The methodology used by Carbonara et al. (2015) to assess risk management in PPP motorway projects serves as a key reference study here. In that study, they analyzed risk on the probability and impact on the projects; moreover, they assessed risk allocation and the suitability of mitigation strategies, both of which are essential risk management processes. The results of that study were compared to real-world practices applied to PPP projects that relate to actual roads and motorways. The survey questions in the current study were structured and designed while bearing this study in mind.

Most researchers in previous studies discuss the limitations of the methodology. Hartman and Jugdev (1998) and Schmidt, Lyytinen, and Keil (2001) state that the number of experts in this area is small, and that only a limited number of organizations can conduct surveys (Niederman, Brancheau, & Wetherbe, 1991; Nambisan, Agarwal, & Tanniru, 1999). Limitations vis-à-vis geographical locations can also be seen when conducting a Delphi survey (Brancheau, Janz, & Wetherbe, 1996). Although the methodology is expert-based, these limitations can lead to insufficient analysis.

Despite the limitations inherent in this method, it is a flexible and highly suitable research tool for the current purposes (Skulmoski et al., 2007). This method is considered suitable for evaluating projects, and many authors have undertaken both quantitative and qualitative research while using the Delphi technique (i.e., Skulmoski et al., 2007; Carbonara et al., 2015; Okoli & Pawlowski, 2004).

Chapter 4 Research Methodology

In this chapter, Delphi methodology is presented including the rule of Delphi technique and how researcher follows them, how risks are identified in current study, how the questionnaire was designed and finally research findings.

4.1 Delphi Methodology

Delphi technique is used for collecting data in our study. This method is widely used method for getting experts' opinion and judgments by conducting survey to collect data in several subjects. There are several characteristics that needs to follow in order to run Delphi survey (Rowe & Wright, 1999). For example, to get an effective analysis, participants should be able to express their opinion freely or change their view in next rounds. In the followings, main critical aspects of this method will provided:

1) Experts' size in Delphi

Witkin (1995) suggested the size for Delphi survey under 50 when Ludwig (1997) says between 15 and 20 is enough to run Delphi methodology. In this study, the survey was sent for 25 experts who work in the e-government field of Uzbekistan and gotten 16 responses in the first round, 15 in the second and run our analysis with 15. Six of those experts belong to public sector who work in the Ministry of Development of IT and Communications, Ministry of

Economy, «Electronic Government» System Development Center [6] and Business Development Center "Uzbektelecom" [7] in Uzbekistan. Those four organizations are responsible for the investment and implementation of e-government projects in Uzbekistan. From the private sector, we got only two responses from LG CNS Uzbekistan[8] that is currently implementing the system. The third group of respondents are from academic who work as a professor in Tashkent University of Information Technology. Two of them are ITPP Alumni from SNU who were PhD candidates and their dissertations were about e-government of Uzbekistan. We considered them right experts for our survey from an academic party. Finally, for the last group, consulting party, we got three responses who actually work in Fido Business [9] and Huawei Tech

[6] Under the Ministry for development of information technologies and communications of the Republic of Uzbekistan. Responsible for the implementation and development of e-government system in Uzbekistan.

[7] BDC "Uzbektelecom" provides modern high-end telecommunications solutions and world-class service in the territory of the Republic of Uzbekistan.

[8] LG CNS Uzbekistan LLC - A joint venture between LG CNS and Uzbekistan government. Responsible for Informatization in public and private sector settings. https://lgcns.com/LGCNS.GHP.Main/News/NewsDetail?SERIAL_NO=1553

[9] "FIDO-BIZNES" Company is one of the largest designers and vendors of information systems and technology solutions in the Uzbekistan. http://www.fido-biznes.uz/en/pages/istoriya

Investment Tashkent[10]. They have an enough experience in this field and have consulted for several times before.

There are five experts who have up to 5 years experiences whom tree of them consultants from Huawei Tech Investment Tashkent and Fido Business, one of them from private sector that come from LG CNS Uzbekistan and one from Business Development Center "Uzbektelecom". Our respondents who have 6-10 years experiences are one from academic, one from LG CNS and the rest from public sectors who currently work at government organizations that counted above. Surprisingly, all the rest who have been working up to 15 years and above are professors from academic sector.

2) The consensus level of Delphi method

There are several opinions in the previous studies when it comes on consensus level of the Delphi method. When Sumsion (1998) says 70% is the most recommended, some suggest 80% as well (Green, Jones, Hughes, & Williams, 1999). But as Dajani, Sincoff, & Talley (1979) recommends when there is more than 51% in agreement, the consensus level can be achieved. Many authors have followed the suggested consensus level by these researchers.

[10] Huawei Tech Investment Tashkent is one of a leading telecom solutions provider which has 15 years of experience in Uzbek market. http://news.uzreport.uz/news_8_e_141444.html

To assess the consensus level of risk relevance, allocation and mitigation strategies, a different approach is used in this study. More than 50% for each of the risk in the questionnaire is planned to achieve. This goal is achieved after running the second round.

von der Gracht (2012) investigated 15 different types of consensus measures over Delphi rounds that listed below by reviewing works of literature. He sums up a reveal that a general standard for consensus measurement.

1) Stipulated number of rounds
2) Subjective analysis
3) Certain level of agreement
4) APMO Cut-off Rate (average percent of majority opinions)
5) Mode, mean/median ratings and rankings, standard deviation
6) Interquartile range (IQR)
7) Coefficient of variation
8) Post-group consensus
9) Chi square test for independence
10) McNemar change test
11) Wilcoxon matched-pairs signed-ranks test
12) Intra-class correlation coefficient, kappa statistics

13) Spearman's rank-order correlation coefficient

14) Kendall's W coefficient of concordance

15) t-statistics, F-tests

Finally, the researcher recommended to pretest those questionnaires and concluded with a suggestion of focusing on new formulas to analyze databases. J. M. Tastle & Tastle (2006) made a few research on consensus measurement and developed a formula utilizing (Shannon, 1948) entropy (1). Their approach on this task is to fix specially the mean value of Likert scale evaluations and to calculate the consensus.

$$H(X) = -\sum_{i=1}^{n} p(x_i) \log_2 p(x_i) \qquad (1)$$

Here X is n categories that needs to be investigated when p_i is our probability (x_i).

$$Cns(X) = 1+\sum_{i=1}^{n} p_i \log_2 (1 - \frac{|X_i - \mu_x|}{d_x}) \quad (2)$$

X is the Likert scale, p_i is the probability as mentioned before, d_x is the width. The mean, μ_x is the expected value (W. J. Tastle & Wierman, 2005).

3) Delphi rounds.

Delbecq, Van de Ven, & Gustafson (1975) suggest two or three iteration Delphi can be sufficient which has been seen in most research. But the goal is to

achieve consensus level, so we considered that we would not stop our rounds until we don't achieve our consensus level that we planned. We could not achieve in one round the consensus, therefore we sent back the survey to the experts with the results of the first round. The second round was run very efficiently and the level was achieved at that time.

4.2 Risk Identification and Classification for E-government PPP Projects

One of the key issue in any PPP projects is risk management (Chan et al., 2010). Identification and classification of risks in risk management is the first step. This includes recognition of risks in all E-government PPP projects and clarification of them in the case of Uzbekistan which may occur during the project implementation. In this study, checklist is produced to identify risks based on the previous studies. To generalize them papers that included a list of risks were reviewed.

While conducting an extensive literature review, a list of risks related to E-government PPPs was not identified. After reviewing previous literature, around 30 risks were identified and categorized to make it more understandable for the survey participants. Therefore, we looked through for general risks that

can be suitable for all kind of PPPs. Then, those collected risks were sent to some academic and practitioner experts in this field in order to recognize a list of risks that are mostly seen in E-government PPPs. A half of those collected risk factors were chosen to use in our survey and a pilot was sent to some participants from public and academic sides to select proper risks for Uzbekistan. A total of 16 risks for E-government PPP projects in Uzbekistan were picked after conducting a pilot (Table-3).

Table 3: Risks that can occur in e-government PPP projects

Risk Categories	Risk factors	Literature
Political and Legal risks	Legislation change	(Chan et al., 2010), (Ke et al., 2010), (Bing et al., 2005), (Carbonara et al., 2015), (Ng & Loosemore, 2007).
	Change in tax regulation	(Chan et al., 2010), (Ke et al., 2010), (Bing et al., 2005), (Carbonara et al., 2015), (Kumaraswamy et al., 2010), (Ng & Loosemore, 2007), (Medda, 2007)
	Nationalization/ Expropriation	(Chan et al., 2010), (Ke et al., 2010), (Bing et al., 2005), (Medda, 2007)
	Poor public decision-making progress	(Chan et al., 2010), (Ke et al., 2010)

Construction risks	Time for completion	(Chan et al., 2010), (Ke et al., 2010), (Bing et al., 2005), (Carbonara et al., 2015), (Ng & Loosemore, 2007)
	Construction cost overrun	(Ke et al., 2010), (Bing et al., 2005), (Carbonara et al., 2015), (Ng & Loosemore, 2007)
	Quality of finished works	(Ke et al., 2010), (Ng & Loosemore, 2007)
Operation and Performance risks	Operation cost overrun	(Chan et al., 2010), (Ke et al., 2010), (Bing et al., 2005), (Carbonara et al., 2015), (Ng & Loosemore, 2007)
	Lack of supporting infrastructure	(Chan et al., 2010), (Ng & Loosemore, 2007)
	Technology risk	(Ke et al., 2010), (Kumaraswamy et al., 2010)
	Design risk	(Bing et al., 2005), (Carbonara et al., 2015), (Kumaraswamy et al., 2010)
Financial and Economic risk	Inflation	(Chan et al., 2010), (Ke et al., 2010), (Bing et al., 2005), (Carbonara et al., 2015), (Kumaraswamy et al., 2010), (Ng & Loosemore, 2007)
	Interest rate fluctuation	(Chan et al., 2010), (Ke et al., 2010), (Bing et al., 2005), (Carbonara et al., 2015), (Ng

		& Loosemore, 2007), (Medda, 2007)
	Foreign Exchange fluctuation	(Chan et al., 2010), (Ke et al., 2010), (Carbonara et al., 2015), (Medda, 2007)
Natural risks	Force majeure	(Chan et al., 2010), (Ke et al., 2010), (Bing et al., 2005), (Carbonara et al., 2015), (Kumaraswamy et al., 2010), (Ng & Loosemore, 2007)
	Environmental risks	(Chan et al., 2010), (Ke et al., 2010), (Bing et al., 2005)

4.3 Questionnaire Design.

The questionnaire in this study is divided into five parts:

- A description of risks will be shown in the first part (Table-5).
- In the second part, questions will be given about experts' background.
- In the third section, **the relevance of risks in e-government PPP** projects will be will be evaluated. Experts will be asked to response the questions about **the probability** of the risk occurrence and the **risk impact** on the e-government PPP projects.
- Then allocating those risks will be asked. In this part, experts should perceive the allocation among parties (public and private or negotiating together).

- In the last part of the questionnaire risk mitigation strategies will be provided for each risk factor and experts will be asked to evaluate how each strategy suitable for mitigating risks in e-government PPP projects.

Providing a list of risks with their description associated with E-government projects in terms of Uzbekistan is the first part of the surveys (Table-5). It helps to make uniform the interpretation of the risks used in the questionnaire (Carbonara et al., 2015). Some general questions and their answers about the expert's background which are provided in the second part were shown in the Table-4.

Table 4: Background information of the experts

Perspective of the experts			
Perspective:	Public sector	Private sector	Academic	Consultant
	6	**2**	**4**	**3**
Background of the experts			
Field:	Economics	Engineering	Financing	Other
	3	**10**	**1**	**1**
Years of experience of the experts			
Years:	1-5 years	6-10 years	11-15 years	over 16 years
	5	**7**	**2**	**1**

We sent an invitation for participating in the survey to 25 experts in the first round but received 16 responses, while 15 of them filled the questionnaire in the second round.

Table 5: A list of risks with their description

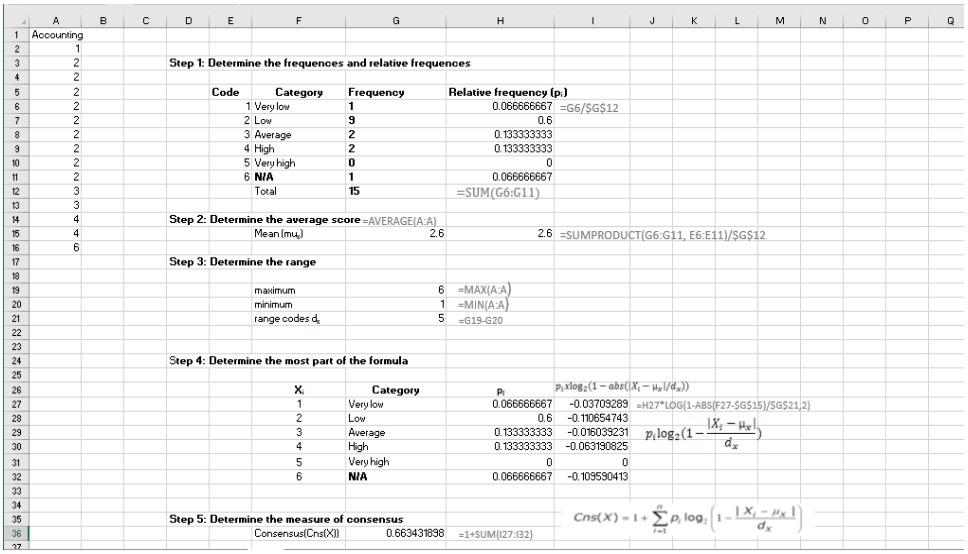
Risk Categories	Risk factors	Description of each risk
Political and Legal risks	Legislation change	When government changes laws, regulations and other policies and this causes cost overrun or revenue decrease in projects
	Change in tax regulation	When government changes tax regulation
	Nationalization/ Expropriation	When government seizes the projects
	Poor public decision-making progress	A lack of experience in PPP projects or preparing insufficiently preparation which leads to poor decision making
Construction risks	Time for completion	When time for completion of project delays and it causes to insufficient cash flow
	Construction cost overrun	Extremely sensitives (a delicate balance of financial covenants, ratios and commitments) that bring changes in cost

	Quality of finished works	The works that after finishing give satisfaction of tests and inspections or capable of delivering output in accordance with the project expectations
Operation and Performance risks	Operation cost overrun	When operation cost of PPP projects is higher than expectance
	Lack of supporting infrastructure	When the project does not have supported facility
	Technology risk	The use of inappropriate technology which is not able to meet the requirements
	Design risk	The project's performance standards and design specifications are inappropriate for the project's needs
Financial and Economic risks	Inflation	When local economy or banking system of the country cannot control inflation rate
	Interest rate fluctuation	When interest rates cause the project cost an increase
	Foreign Exchange fluctuation	When foreign exchange rate inside country causes the project cost a rise
Natural risks	Force majeure	When terrorism or natural catastrophes affect project operation

	Environmental risks	When the implementation of the project affect natural resources

In this study, the measure of consensus developed by W. J. Tastle & Wierman (2005) is applied. The data was analyzed using Microsoft Excel. There is an example of how to measure consensus in the probability of risk in the figure 1. For the evaluation of the relevance of the risks and how provided strategies suitable for mitigating those risks, we used a five-point Likert scale. From 1= very low to 5=very high for the probability of the risk occurrence and the risk impact. In this case, experts can also able to choose "not applicable" (N/A) if they are unsure. Regarding suitable risk mitigation strategies, from 1= strongly suitable to 5= strongly unsuitable are used in Likert scale as well. To measure the allocation of risks, questions will be provided with 1= public sector, 2= shared between the public and private sector and 3= private sector options in a three-point Likert scale. Our experts were asked to answer honestly and not prejudicially.

Figure 1 Example of a measure of consensus (Tastle and Wierman) using Microsoft Excel



	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1	Accounting																
2	1																
3	2			**Step 1: Determine the frequences and relative frequences**													
4	2																
5	2				**Code**	**Category**	**Frequency**	**Relative frequency (p_i)**									
6	2				1	Very low	**1**	0.066666667	=G6/$G$12								
7	2				2	Low	**9**	0.6									
8	2				3	Average	**2**	0.133333333									
9	2				4	High	**2**	0.133333333									
10	2				5	Very high	**0**	0									
11	2				6	**N/A**	**1**	0.066666667									
12	3					Total	**15**	=SUM(G6:G11)									
13	3																
14	4			**Step 2: Determine the average score** =AVERAGE(A:A)													
15	4					Mean (mu_x)	2.6	2.6	=SUMPRODUCT(G6:G11, E6:E11)/$G$12								
16	6																
17				**Step 3: Determine the range**													
18																	
19						maximum	6	=MAX(A:A)									
20						minimum	1	=MIN(A:A)									
21						range codes d_x	5	=G19-G20									
22																	
23																	
24				**Step 4: Determine the most part of the formula**													
25																	
26						**X_i**	**Category**	**p_i**	$p_i x \log_2(1 - abs(\lvert X_i - \mu_x \rvert / d_x))$								
27						1	Very low	0.066666667	-0.03709289	=H27*LOG(1-ABS(F27-$G$15)/$G$21,2)							
28						2	Low	0.6	-0.110654743								
29						3	Average	0.133333333	-0.016039231	$p_i \log_2(1 - \frac{\lvert X_i - \mu_x \rvert}{d_x})$							
30						4	High	0.133333333	-0.063190825								
31						5	Very high	0	0								
32						6	**N/A**	0.066666667	-0.109590413								
33																	
34																	
35				**Step 5: Determine the measure of consensus**					$Cns(X) = 1 + \sum_{i=1}^{n} p_i \log_2 \left(1 - \frac{\lvert X_i - \mu_X \rvert}{d_X}\right)$								
36						Consensus(Cns(X))	0.663431898	=1+SUM(I27:I32)									

In order to calculate consensus of the data, firstly, we need to calculate the mean and range. Then, we go to the main part of the formula in the step 4. In the last step, we define the consensus. To calculate the mean, first, we need to find frequencies and relative frequencies. Frequencies are the amount of choices that people chose each categories. To do it, **=COUNTIF(range, criteria)** is needed to be coded in Microsoft excel. Relative frequencies or $\mathbf{p_i}$ is calculated as dividing each frequency by the total number of the frequencies. Clearly, it is about identifying the percentage of agreements on each categories. The code is **=(**category/total**)**. Moreover, the amount of N/A responses that

chosen in the questionnaires are not counted to get clear consensus level. Thus, the total amount is also changes according to chosen N/A.

μ_x is the mean of X. For determining the mean (μ_x), μ_x=$\sum_{i=1}^{n} p_i X_i$, here p_i is our outcome X_i (X_i ranges from 1 to 5). In order to calculate in Excel, needed to type **=SUMPRODUCT(**frequency,range**)/**total using frequency table or just =**AVERAGE**(all scores). Step 3 is to determine d_χ. d_χ is the width of X and counts $\mathbf{d_X = X_{max} - X_{min}}$.

Step 4 contains of calculating big part of the formula, which is =$p_i \log_2(1 - abs(|X_i - \mu_x|/d_x))$. ***abs*** is an absolute value that is a function in Excel. In the last step, we just need to sum all of the results in in the step 4 and plus it to 1 **(=1+SUM**(all step 4 results)**)**.

The results of the first-round were analyzed and resent with results to the experts in the second round. By doing so, participants could able to see their choice with compared of the rest. They would have chance to change their answers or remain it. When we reached our consensus, we stopped the procedure.

4.4 Results from Delphi Method

4.4.1 Relevance of Risks

Table 3 shows the assessment done by the experts on the probability of risk occurrence and the risk impact in the E-government projects when those risks occur. The scores are labeled as *Unlikely* (below average (1-2)), *Likely* (average (3)) and *Very Likely* (above average (4-5)) for the probability of risk occurrence and *Minor*, *Moderate* and *Major* for the risk impact respectively. As shown in that table, the consensus level for all 16 risks reached in the second round.

In order to show the significance of those risks, the Risk Probability-Impact Matrix was made where *y*-axis and *x*-axis illustrate the probability of occurrence and the risk impacts respectively (Figure 1). PIM shows that there are no catastrophic risks which could have been included in the red color. Here, yellow color indicates medium relevance risks and green means low.

Even Legislation change and Nationalization risks are likely to occur, they have a negligible impact on the e-government PPP projects. On the other hand, when completion risk may impact high, the occurrence is improbable.

Table 6: Summary of risk assessment

Risk factors	Probability	Impact
Political and Legal risks		
Legislation changes	Likely	Minor
Change in tax regulation	Unlikely	Moderate
Nationalization/Expropriation	Likely	Minor

Poor public decision-making progress	Unlikely	Minor
Construction risks		
Completion risk	Unlikely	Major
Construction cost overrun	Likely	Moderate
Quality of finished works	Unlikely	Minor
Operation and Performance risks		
Operation cost overrun	Likely	Moderate
Technology risk	Unlikely	Moderate
Lack of supporting Infrastructure	Unlikely	Moderate
Design risk	Unlikely	Minor
Financial and Economic risks		
Inflation	Likely	Moderate
Interest rate fluctuation	Unlikely	Minor
Foreign exchange fluctuation	Unlikely	Minor
Natural risks		
Force majeure	Unlikely	Minor
Environment risk	Unlikely	Minor

About 44% of the risks have low likelihood of occurrence. All the rest 56% of the risks are included in the yellow. Lack of supporting infrastructure, time for completion and construction cost overrun risks were evaluated as high in terms of both probability and impact by almost half of experts in the first round, but when the second run, around 15% changed to the medium which made those risks reduce slightly from red sector of the PIM matrix.

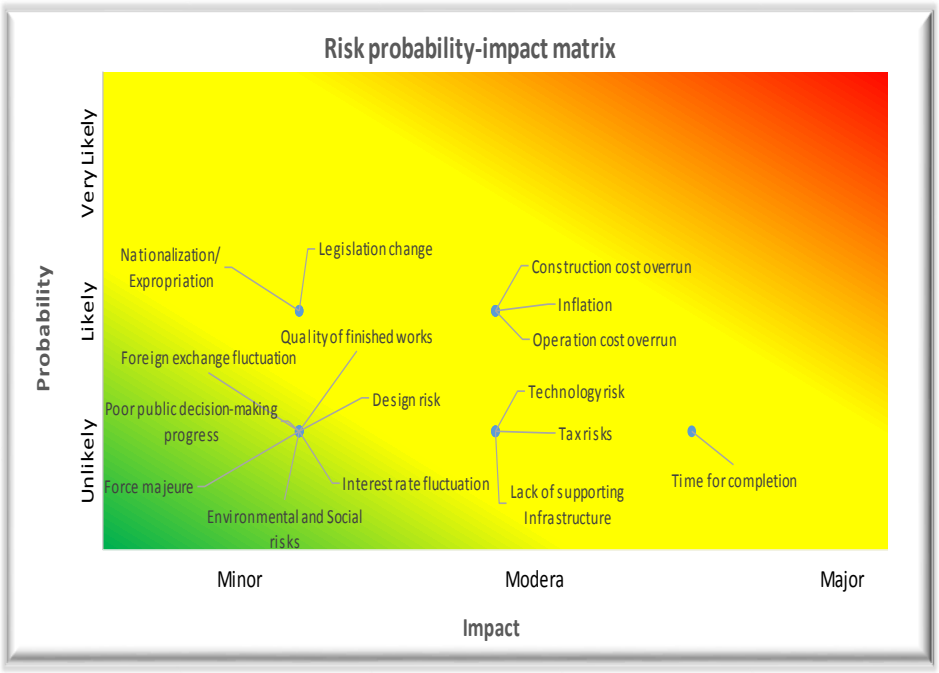


Figure 2 Risk probability-impact matrix (PIM)

4.4.2 Risk Allocation

The most surprising thing that showen in the results is none of the risks were not allocated to the Private sector. Experts percieve that Nationalization/ Expropriation, Lack of supporting infrastructure and foreign exchange fluctuation risks should be allocated to the public sector while all the rest risks considered be equally shared between parties (Table 4).

Table 7: Risk allocation matrix

Risk Factors	Public	Equally shared	Private
Legislation change		✓	
Tax risks		✓	
Nationalization/ Expropriation	✓		
Poor public decision-making progress		✓	
Time for completion		✓	
Quality of finished works		✓	
Construction cost overrun		✓	
Operation cost overrun		✓	
Lack of supporting Infrastructure	✓		
Technology risk		✓	
Design risk		✓	
Inflation		✓	

Interest rate fluctuation		✓	
Foreign exchange fluctuation	✓		
Force majeure		✓	
Environmental risks		✓	

The Delphi findings proves (Delmon, 2011) the key message for policy makers which he suggested not to cram risks on the private sector as it will over crises, changes and may become more expensive and inefficient. On the other hand, it showed the allocation on negotiating between each other. The experts preferred to work on most risks equally to successfully implement e-government projects in Uzbekistan.

4.4.3 Risk Mitigation Strategies

Finally, concerning to find the suitable mitigation strategies, Table 5 shows strategies that can mitigate those risks. These strategies were retained as judged suitable (S) and neutral (N) based on Likert scale that provided in the survey. Those which were considered as unsuitable (scores 1 and 2 in the Likert scale) were not shown in the Table.

According to Delphi, technique rules that needed to evaluate consensus level should have been done in the study. To achieve clearer valuation, more than 50% consensus is planned to achieve for identifying suitable mitigation strategies in this study. After second round we achieved our consensus level for each below mitigation strategies. Mitigation strategies that provided in the survey was collected from previous literature.

Most of the risks are perceived as suitable for mitigating existed risks when only 5 of them are selected as neutral. Notice that those which were perceived as unsuitable were not included in the below table. Some mitigation strategies that opposite to the political issues were perceived as unsuitable by public and academic sectors in both rounds.

During the analysis on mitigation strategies, it can be seen that the experts evaluated carefully the suitability of all strategies that provided for the risks in the yellow color risk probability-impact matrix.

Table 8: Mitigation strategies to mitigate them

Risk category	Risk mitigation strategy	
Political and Legal risks		
Legislation change	Extension of concession	S
	Government assurances	S
	Compensation from government	S
Change in tax regulation	Tax holidays	S
	Tax relief and exemptions,	S
	Relaxation of taxes of imported materials and equipment	S
Nationalization/Expropriation	Must compensate the owner according to international law	S
Poor public decision-making progress	Training programs for government officials on e-government projects from international experts	S
	More experienced consultants should be involved	S

Construction risks		
Time for completion	Should be mitigated through a provision under concession contract	S
	Independent Engineer should review and monitor the progress	S
	Contractor to pay Liquidated Damages for delay during construction	S
Construction cost overrun	Additional capital	S
	Fixed price (lump sum) contracts	S
	Guaranteed Maximum Price agreement	S
	Escrow account to complete the project	N
	Take out of lenders	N
Quality of finished works	The cost of financial restructuring should be borne by the contractor	S
	The satisfaction of certain test and inspections should be monitored	S

Operation and Performance risks		
Operation cost overrun	Maintenance bonds	N
	Maintenance reserves	N
	Fixed price and fixed duration operation contracts	S
Lack of supporting infrastructure	More investigations by local experts on infrastructure	S
	Needs a comprehensive analysis of the infrastructure before designing the project	S
Technology risk	Needs a comprehensive analysis of the local conditions before designing it	S
	A construction supervision should be carried out for non-compliance of the technical design by the Contractor	S
	The cost of rectifying such non-compliance would be borne by the contractor	N
Design risk	Defect liability clause in contract	S
Financial and Economic risk		
Inflation	Adjust concession price; debt guarantee	S
	Compensation payment	S

	Inflation caps/floors	S
Interest rate fluctuation	Interest rate guarantee	S
Foreign Exchange fluctuation	Exchange rate guarantee	S
Natural risk		
Force majeure	Government indemnities for force majeure suspending clauses	S
Environmental risks	Projects must meet minimum environmental requirements	S
	Local law should be set out in the similar level of compliance	S

4.5 Risk-management in practice: Comparison of Delphi results with Real Practice

The results of the questionnaire are compared with real practices on risk-management applied in two E-government projects. The table 1 below illustrates the main details of the projects on E-government in Uzbekistan.

Comparing Delphi questionnaire results with real practice provides comprehensive research.

Table 9 Projects overview

Name	Partners	Contract duration	Budget	Source
E-Government promotion for improved public service delivery	UNDP	3 years (2014-2017)	$1 million	UNDP report for the project of "E-Government promotion for improved public service delivery"[11]
Informatization of the Central State Archives in Uzbekistan	KOICA	12 months (2008-2009)	$5.2 million	Ex-Post Evaluation on the Project for Informatization of the Central State Archives in Uzbekistan[12]

[11] http://www.uz.undp.org/content/uzbekistan/en/home/operations/projects1/democratic_governance/e-government-promotion-for--improved-public-service-delivery-.html

[12] http://www.koica.go.kr/download/2015/0010.pdf

The case study with UNDP projects shows that all four risks have a moderate impact when the probability of financial risk is unlikely but the other three have likely probability when they occurred. As for a comparison with our study, financial risks show a low relevance in real case that do not match with the Delphi results. These risks occurred when the government delayed its cost share contribution to the project, because half of the budget spent from the public side.

In terms of mitigation strategies, when UNDP experts suggest regular trainings to mitigate the risk of poor public-decision making process, our findings add to the list more experienced consultants to be involved. As, this may influence to the decision making process and improve it. Political and legal risks are mitigated though supporting policy advises by UNDP, our experts prefer to compensate or assure by the Uzbek government. Lack of infrastructure risk, which may bring other financial and operational risks are suggested to mitigate through monitoring regularly in real practice when the research provides more investigations and analysis strategies before starting the implementation. Lastly, UNDP experts provide general implications that the public site should take care of financial risks later.

Table 10 Risk-management for E-Government promotion for improved public service delivery (UNDP)

Risks	Relevance	Mitigation strategies
Poor public decision-making progress	Probability = 3 Impact = 4	Regular trainings
Political and legal risks	Probability = 3 Impact = 4	Support with policy advise and constant dialogue with key government organizations
Lack of supporting infrastructure	Probability = 3 Impact = 3	Constantly monitor donor activities in the field and organize regular meetings and consultations with relevant donors to avoid possible overlapping in e-Government initiatives
Financial risks	Probability = 1 Impact = 2	All financial delays from the government should be undertaken

Another case, which is about informatization of the Central State Archives in Uzbekistan, experienced certain risks during the implementation such as delay of schedule, low technical level, lack of infrastructure, finance and legislation. KOICA implemented this project in order to preserve historical heritage of Uzbekistan and later evaluated. There were no specific strategies suggested or utilized by KOICA in order to mitigate those risks, moreover, they consider Uzbek partners should undertake all of them. This project included only three central state archives but there are 92 public and 104 private archives and there is a master plan to build six databases in the future. Therefore, the research plans to provide some mitigation strategies and specific policy implications in order to better handle when those risks will occur.

Chapter 5 Conclusions

Chapter 5 provides Policy implications that suggested by the researcher for Uzbek government and policy makers to take risks for successful e-government implementation, then gives conclusions of the study and limitations.

5.1 Policy Implications

Delphi survey was conducted in this study to identify risks, allocate them and assess suitable risk mitigation strategies in E-Government PPP projects for deriving proper policy implications which aim to help the government and policy makers to successfully implement and design electronic government system in Uzbekistan.

The first significant policy implication for policy makers in Uzbekistan is providing supportable infrastructure before implementing e-government system. This may affect the quality of service delivery which then will bring for low demand from the users. In this case, the government needs to make a comprehensive analysis by attracting local experts to evaluate infrastructure before implementing the system.

The second implication is that public side should fix prices and duration of the operation contracts in order to control operation costs. Usually these expenses would be higher than expected and require more additional

maintenance reserves. In most developing countries there is a lack of finance and incapable for additional expenses. This may bring them interruption of operation which causes revenue losses. Moreover, specific budgets for maintenance bonds and reserves are also preferable to cover operational costs in order to provide constantly e-government implementation.

The third policy implication is that government should control time for completion of the project due to not experience a delay that bring insufficient cash flows. Even though the respondents found a delay in completion as unlikely in the case of Uzbekistan, it has a major impact on the implementation. To prevent this, public side is expected to require a payment for delay of construction from the contractor and it should be shown in the concession contract. Additionally, a separate engineer should monitor completion time of the implementation. Our experts suggested for both parties to be equally responsible.

The next implication concerns the requirement for appropriate technology. First, the policy makers should analyze local condition to be aware of technological infrastructure that will be needed before starting designing the e-government implementation. Another is that a construction supervision should be carried out for non-compliance of the technical design. The government

should request the cost of rectifying such non-compliance to borne. In this case, both parties should be equally responsible for delivering an adequate technology to meet the requirement.

The fifth policy implication is a prohibition of taking projects. Attempting of nationalization causes poor quality implementation. In order to prevent from this and attract foreign investors, it must be compensated according to international law. The government should develop the law on nationalization and expropriation and provide guarantees for constructors and financial institutions to provide them good market condition.

The sixth policy implication for policy makers is to develop training programs for government officials by inviting international experts. This is important for government officers to make right decision. In addition, more experienced consultants should be involved to prevent from poor decision making processes.

Another policy implication is related to political and legal issues that have great impacts for project financing and an insurance from the Government is needed to prevent it. In order to invest for projects, private sectors usually check the political condition before entering the market. So, the government needs to provide guarantees for the constant legislation. Additionally, establishing

compensation clauses to prevent legislation changes is considered as a good way to attract investments to implement projects.

The eighth policy implication that can be suggested for the policy makers covers about another political and legal barrier for investments. Most private companies usually seek tariff and revenue guarantees from public sectors. Dealing with changing in tax regulation is another challenge for the private parties to make investment decisions. Furthermore, the authority should assign deferment payments of the concession fees which shows free trade for foreign investors.

Finally, the government should provide debt guarantees for foreign investors to protect from inflation. In addition, adjusted concession prices and compensation payments should be provided by the government in case of inflation. Specifically, the government should consider a policy to pay inflation caps and floors over the specified period if it exceeds.

So based on our Delphi results, to mitigate delays in both projects there should be a provision under concession contract and an independent engineer should monitor them. As we said for financial risks private partners of the Uzbek government suggested to allocate to the public sector, our results suggest specific mitigation strategies that are about guarantees, compensation payments

rather than general ones. In terms of infrastructure that are still lacking both our research and experts from private sectors suggested appropriate strategies to mitigate that risk and hopefully policy makers from public sector will consider these in the future. The study has been compared with real practice on risk-management applied in two e-government PPP projects that already finished in order to achieve main purpose of the research and to show the importance of the study on this field.

5.2 Conclusions

This research is about risk-management which is one of the most critical issue that might affect to the successfully implementation of PPP projects. In this study, the researcher has made an investigation on the e-government projects of Uzbekistan to find the relevance of risks, allocate and provide appropriate risk mitigation strategies. To collect and analyze data a Delphi survey was distributed for the experts who have been working on the implementation of e-government system of Uzbekistan.

Based on the results, 9 policy implications have been suggested for government officers to reduce risks when they resistance on the e-government implementation. Moreover, in project financing, the most important issue that makes investors think a lot before investing on the projects is related to

inflation. In order to mitigate this risk this study suggests the Uzbekistan government provide debt guarantees in order to ensure them in the local market.

Moreover, in order to improve decision-making processes in the development of e-government system in Uzbekistan, policy makers are needed to be educated by foreign experts on both e-government and PPP. By doing so, they can enable to make important and right decisions in the implementation of the system.

This study has some limitations such as number of participants, even though, Delphi allows to make a research with small amount of size. These kind of limitations that counted below mean that need deep analysis make the investigation strong.

Most of previous studies are about energy, motorway, railway, tunnel and bridge PPP projects. Therefore, this work opens the doors for few research areas in infrastructure projects that will contribute to further improvements in the e-government system.

5.3 Limitations

The research has several limitations that has to be carry out in the future. First is that, the size of the participants that attracted in this study is small and this survey was conducted with only one organization from the private sector. As a

small size and limited participants narrow the scope of the study and results. In this case, other responsible companies in the private sectors are needed to involve to obtain a large amount of experts.

The second limitation in this research is related to the respondents' area that they stay. Clearly, the more policy makers from the different cities of Uzbekistan had been attracted, the more qualitative results from the survey would have been achieved. Because, experts from that areas can evaluate clearly some risks such as related to infrastructure of there and suggest more suitable mitigation strategies.

Another limitation is about a comparison of the results with real practices that done in Uzbekistan before. If the study had been compared with the e-government projects done from 2003 to 2010 in Uzbekistan, more comprehensive analysis could have been achieved.

The last limitation from the study is that there is a need for deep investigations on identifying proper risks on PPP projects in e-government, as no previous studies investigated before in this. Moreover, general risks that can be appropriate for all PPP projects have been selected in the study to assess the risks in e-government implementation in the case of Uzbekistan.

Reference

Al-Khouri, A. M. (2014). Global e-Government: What needs to be Learned? A Reflection on UN e-Government Survey 2014. *International Journal of Innovation and Applied Studies, 7*(1), 262.

Baccarini, D., Salm, G., & Love, P. E. (2004). Management of risks in information technology projects. *Industrial Management & Data Systems, 104*(4), 286-295.

Bing, L., Akintoye, A., Edwards, P. J., & Hardcastle, C. (2005). The allocation of risk in PPP/PFI construction projects in the UK. *International Journal of Project Management, 23*(1), 25-35.

Brancheau, J. C., Janz, B. D., & Wetherbe, J. C. (1996). Key issues in information systems management: 1994-95 SIM Delphi results. *MIS quarterly*, 225-242.

Carbonara, N., Costantino, N., Gunnigan, L., & Pellegrino, R. (2015). Risk management in motorway PPP projects: Empirical-based guidelines. *Transport Reviews, 35*(2), 162-182.

Chan, A. P., Yeung, J. F., Yu, C. C., Wang, S. Q., & Ke, Y. (2010). Empirical study of risk assessment and allocation of public-private partnership projects in China. *Journal of Management in Engineering, 27*(3), 136-148.

Choudhari, R., Banwet, D., & Gupta, M. (2007). Identifying Risk Factors in for E-governance Projects. *A. Agarwal, & VV Ramana, Foundations of E-government*, 270-277.

Dajani, J. S., Sincoff, M. Z., & Talley, W. K. (1979). Stability and agreement criteria for the termination of Delphi studies. *Technological forecasting and social change, 13*(1), 83-90.

de Oliveira Almeida, G., & Zouain, D. M. (2015). E-GOVERNMENT IMPACT ON THE DOING BUSINESS RANKINGS AND NEW BUSINESS OWNERSHIP RATE: AN ANALYSIS OF THE

DYNAMICS BASED ON COUNTRIES'S INCOME FROM 2008 TO 2014. *IADIS International Journal on WWW/Internet*, *13*(1).

Delbecq, A. L., Van de Ven, A. H., & Gustafson, D. H. (1975). *Group techniques for program planning: A guide to nominal group and Delphi processes*: Scott Foresman.

Delmon, J. (2011). *Public-private partnership projects in infrastructure: an essential guide for policy makers*: Cambridge University Press.

Evangelidis, A. (2005). FRAMES–a risk assessment framework for e-services. *Electronic Journal of e-government*, *2*(1), 9.

Green, B., Jones, M., Hughes, D., & Williams, A. (1999). Applying the Delphi technique in a study of GPs' information requirements. *Health & social care in the community*, *7*(3), 198-205.

Hartman, F., & Jugdev, K. (1998). Leadership undertow: Project manager fears and frustrations. In *Proceedings of the 29th Annual Project Management Institute Seminars and Symposium, Long Beach, USA*.

Heeks, R. (2003). *Most e-government-for-development projects fail: How can risks be reduced?* (Vol. 14). Manchester: Institute for Development Policy and Management, University of Manchester.

Ke, Y., Wang, S., Chan, A. P., & Lam, P. T. (2010). Preferred risk allocation in China's public–private partnership (PPP) projects. *International Journal of Project Management*, *28*(5), 482-492.

Kumaraswamy, M., Ling, F., Fischer, K., Leidel, K., Riemann, A., & Wilhelm Alfen, H. (2010). An integrated risk management system (IRMS) for PPP projects. *Journal of Financial Management of Property and Construction*, *15*(3), 260-282.

Ludwig, B. (1997). Predicting the future: Have you considered using the Delphi methodology. *Journal of extension*, *35*(5), 1-4.

Medda, F. (2007). A game theory approach for the allocation of risks in transport public private partnerships. *International Journal of Project Management*, *25*(3), 213-218.

Nambisan, S., Agarwal, R., & Tanniru, M. (1999). Organizational mechanisms for enhancing user innovation in information technology. *MIS quarterly*, 365-395.

Ng, A., & Loosemore, M. (2007). Risk allocation in the private provision of public infrastructure. *International Journal of Project Management, 25*(1), 66-76.

Niederman, F., Brancheau, J. C., & Wetherbe, J. C. (1991). Information systems management issues for the 1990s. *MIS quarterly*, 475-500.

Okoli, C., & Pawlowski, S. D. (2004). The Delphi method as a research tool: an example, design considerations and applications. *Information & management*, *42*(1), 15-29.

Rakhmanov, E. (2009). *The barriers affecting E-government development in Uzbekistan.* Paper presented at the Computer Sciences and Convergence Information Technology, 2009. ICCIT'09. Fourth International Conference on.

Roumboutsos, A., & Anagnostopoulos, K. P. (2008). Public–private partnership projects in Greece: risk ranking and preferred risk allocation. *Construction Management and Economics*, *26*(7), 751-763.

Rowe, G., & Wright, G. (1999). The Delphi technique as a forecasting tool: issues and analysis. *International journal of forecasting, 15*(4), 353-375.

Schmidt, R., Lyytinen, K., Keil, M., & Cule, P. (2001). Identifying software project risks: An international Delphi study. *Journal of management information systems*, *17*(4), 5-36.

Shannon, C. E. (1948). A note on the concept of entropy. *Bell System Tech. J, 27*(3), 379-423.

Skulmoski, G. J., Hartman, F. T., & Krahn, J. (2007). The Delphi method for graduate research. *Journal of information technology education, 6*, 1.

Sumsion, T. (1998). The Delphi technique: an adaptive research tool. *The British Journal of Occupational Therapy, 61*(4), 153-156.

Tastle, J. M., & Tastle, W. J. (2006). Extending the consensus measure: analyzing ordinal data with respect to extrema. *Director*, 07.

Tastle, W. J., & Wierman, M. J. (2005). *Consensus and dissention: a new measure of agreement.* Paper presented at the Fuzzy Information Processing Society, 2005. NAFIPS 2005. Annual Meeting of the North American.

Tchankova, L. (2002). Risk identification–basic stage in risk management. *Environmental Management and Health*, *13*(3), 290-297.

von der Gracht, H. A. (2012). Consensus measurement in Delphi studies: Review and implications for future quality assurance. *Technological Forecasting and Social Change*, *79*(8), 1525-1536. doi:https://doi.org/10.1016/j.techfore.2012.04.013

Wang, S. Q., & Tiong, L. K. (2000). Case study of government initiatives for PRC's BOT power plant project. *International Journal of Project Management*, *18*(1), 69-78.

West, D. M. (2000). Assessing e-government: The Internet, democracy and service delivery by state and federal governments: Brown University Providence, RI.

Witkin, B. R. (1995). *Planning and conducting needs assessments: A practical guide*: Sage.

Appendix – Questionnaire in English

Survey on risk management in E-government PPP projects in Uzbekistan

Dear sir/madam.

My name is Abror Tursunov, Master Candidate in Seoul National University, South Korea. Currently, I am collecting data for my master thesis which is titled "Risk management in e-government PPP projects in Uzbekistan" and I would request your kind cooperation by sacrificing your precious time to the below online survey. The survey mainly focuses on risk-management in Public-Private Partnership (PPP), particularly on e-government project. The results of the initial round of survey will be presented in the next round questionnaire in order to achieve more than 50% of consensus level that is requirement for Delphi method. By doing so, I will be able to see how the variation is among the respondents.

It is encouraged to use your expert ability to answer the research questions, so please take your time (it takes 10-20 minutes) to answer the questions honestly and not prejudicially.

Thank you very much for your cooperation in advance!

Abror Islomiddin o'g'li Tursunov

Part 1: A description of each risk associated with E-government PPP projects in Uzbekistan

Risk Categories	Risk factors	Description of each risk
Political and Legal Risks	Legislation change	When government changes laws, regulations and other policies which will cause an increase in project costs and a decrease in revenue.
	Change in tax regulation	When government changes tax regulation
	Nationalization/ Expropriation	When government seizes the projects
	Poor public decision-making progress	A lack of experience in PPP projects or preparing insufficiently preparation which leads to poor decision making When project delays cause insufficiency in cash flow
Construction Risks	Time for completion	Project delay and cost overrun, etc., which cause insufficient cash flow and inability to pay off debts on time.
	Construction cost overrun	Extremely sensitives (a delicate balance of financial covenants, ratios and commitments) that bring changes in cost.

	Quality of finished works	The works that after finishing give satisfaction of tests and inspections or capable of delivering output in accordance with the project expectations
Operational and Performance Risks	Operation cost overrun	When operation cost of PPP projects is higher than expectance
	Lack of supporting infrastructure	The risks generated by the unavailability of the supporting facilities of the project.
	Technology risk	The use of inappropriate technology which is not able to meet the requirements
	Design risk	The project's performance standards and design specifications are inappropriate for the project's needs
Economic and Financial Risks	Inflation	When local economy or banking system of the country cannot control inflation rate
	Interest rate fluctuation	When interest rates cause the project cost an increase
	Foreign Exchange fluctuation	When foreign exchange rate inside country causes the project cost a rise
Natural Risks	Force majeure	When terrorism or natural catastrophes affect project operation
	Environmental risks	When the implementation of the project affect natural resources

Part 2: Background of experts

Please write your company name where you work

How many years of experience do you have in ICT sector?

- 1-5 years
- 6-10 years
- 11-15 year
- over 16 years

Background of the expert: What is the degree you have completed?

- Economics
- Engineering
- Financing
- Banking
- Law
- Other

Perspective of the expert: Which sector do you belong?

- Public sector
- Private sector
- Academic
- Consultant
- Other

Part 3: The relevance of risks in E-government PPP projects

How do you rate both the probability of each risk occurrence and risk impact on E-government PPP projects in Uzbekistan when it occurs?

Risks	Very low	Low	Average	High	very high	N/A
Legislation change (The probability of risk occurrence)						
Legislation change (Risk impact)						
Change in tax regulation (The probability of risk occurrence)						
Change in tax regulation (Risk impact)						
Nationalization/Expropriation (The probability of risk occurrence)						
Nationalization/Expropriation (Risk impact)						
Poor public decision-making progress (The probability of risk occurrence)						
Poor public decision-making progress (Risk impact)						

Completion risk (The probability of risk occurrence)						
Completion risk (Risk impact)						
Construction cost overrun (The probability of risk occurrence)						
Construction cost overrun (Risk impact)						
Quality of finished works (The probability of risk occurrence)						
Quality of finished works (Risk impact)						
Operation cost overrun (The probability of risk occurrence)						
Operation cost overrun (Risk impact)						
Technology risk (The probability of risk occurrence)						
Technology risk (Risk impact)						
Lack of supporting Infrastructure (The probability of risk occurrence)						
Lack of supporting Infrastructure (Risk impact)						

Design risk (The probability of risk occurrence)						
Design risk (Risk impact)						
Inflation risk (The probability of risk occurrence)						
Inflation risk (Risk impact)						
Interest rate fluctuation (The probability of risk occurrence)						
Interest rate fluctuation (Risk impact)						
Foreign exchange fluctuation (The probability of risk occurrence)						
Foreign exchange fluctuation (Risk impact)						
Force majeure (The probability of risk occurrence)						
Force majeure (Risk impact)						
Environmental risk (The probability of risk occurrence)						
Environmental risk (Risk impact)						

Part 4: The preferred risk allocation between public and private sectors

How do you perceive the allocation of each risk among contracting parties?

Risks	Public sector	Shared between parties	Private sector
Legislation changes			
Change in tax regulation			
Nationalization/Expropriation			
Poor public decision-making progress			
Completion risk			
Construction cost overrun			
Quality of finished works			
Operation cost overrun			
Technology risk			
Lack of supporting Infrastructure			
Design risk			
Inflation			
Interest rate fluctuation			
Foreign exchange fluctuation			
Force majeure			
Environmental risk			

Part 5: The suitability of specific strategies in mitigating risks

How do you consider each mitigation strategy suitable for mitigating following risks in E-Government PPPs?

Risks	strongly suitable	suitable	neutral	unsuitable	strongly unsuitable
Compensation clauses from government (Legislation change)					
Extension of concession (Legislation change)					
Government assurances (Legislation change)					
Compensation from government (Legislation change)					
Tax holidays (Tax risks)					
Tax relief and exemptions (Tax risks)					
Relaxation of taxes of imported inputs (Tax risks)					
Training programs for government officials on e-government					

projects from international experts (Poor public decision-making progress)					
More experienced consultants should be involved (Poor public decision-making progress)					
Must compensate the owner according to international law (Nationalization/ Expropriation)					
Should be mitigated through a provision under concession contract (Time for completion)					
Independent Engineer should review and monitor the progress (Time for completion)					
Contractor to pay Liquidated Damages for delay during construction (Time for completion)					
The cost of financial restructuring should					

be borne by the contractor (Quality of finished works)					
The satisfaction of certain test and inspections should be monitored (Quality of finished works)					
Additional capital (Construction cost overrun)					
Fixed price (lump sum) contracts (Construction cost overrun)					
Guaranteed Maximum Price agreement (Construction cost overrun)					
Escrow account to complete the project (Construction cost overrun)					
Take out of lenders (Construction cost overrun)					
Maintenance bonds (Operation cost overrun)					

Maintenance reserves (Operation cost overrun)					
Fixed price and fixed duration operation contracts (Operation cost overrun)					
Needs a comprehensive analysis of the local conditions before designing it (Technology risk)					
A construction supervision should be carried out for non-compliance of the technical design by the Contractor (Technology risk)					
The cost of rectifying such non-compliance would be borne by the contractor (Technology risk)					
More investigations by local experts on infrastructure (Lack of supporting Infrastructure)					

Needs a comprehensive analysis of the infrastructure before designing the project (Lack of supporting Infrastructure)					
Defect liability clause in contract (Design risk)					
Adjust concession price; debt guarantee (Inflation risk)					
Compensation payment (Inflation risk)					
Inflation caps/floors (Inflation risk)					
Interest rate guarantee, futures, options and swaps (Interest rate fluctuation)					
Exchange rate guarantee (Foreign exchange fluctuation)					
Government indemnities for force majeure; suspending					

clauses (Force majeure)					
Projects must meet minimum environmental and social requirements (Environmental risks)					
Local law should be set out in the similar level of compliance (Environmental risks)					

초록

Abror Islomiddin o'g'li Tursunov

Technology Management, Economics, and Policy Program

College of Engineering

Seoul National University

본 연구는 우즈베키스탄 전자정부 프로젝트에서 발생할 수 있는 위험을 살펴본다. 발생 가능 위험을 규명하고 공공 영역 대비 민간부문에 배분하여 궁극적으로 해당위험완화를 위해, 본 연구는 전자정부 프로젝트와 관련한 민간 및 공공 영역을 평가하였다.

본고는 Delphi 기법을 사용하여 민간 및 공공 영역 응답자에게서 자료를 수집하였다. 1차 조사에서 약 64%의 응답자가 완전 대답을 하였다. 2차 조사에서 해당수치는 60%였다. 자료는 동의측정(Consensus measurement) 평가를 위하여 Tastle 및 Wierman의 공식(2005)을 사용하여 산출하였다.

연구 결과 민간 및 공공 영역의 응답자 누구도 대참사 수준의 위험을 인지하지 않았다. 대부분 위험은 심각한 수준의 상태로 평가되었다. 위험 배분과 관련하여 오직 민간 영역에만 배분되는 위험은 없었다.. 리스크는 민간 및 공공 영역에 균등하게 배분되었다. 위험완화조치는 대부분 적합하다고 평가하였으며 소수만이 중립적 의견을 보였다.

PPP 프로젝트 완료 후 수집한 결과에 따르면 건설비 초과, 인플레이션, 운영비 초과가 상대적으로 고위험영향을 미치는 것으로 인식 된다.. 이에 따라 정부가 이와 같은 문제를 모니터링하고 지속 관리해야 함을 제안한다. 또한, 본 연구 상의 리스크 위험배분 행렬에 제시된 결과에 따라 민간 및 공공 영역이 위험완화를 위해 파트너쉽 구축을 제안한다.

주요 용어: 위험관리(Risk management), 위험배분, 위험완화전략, Delphi 기법, 민관파트너쉽(PPP), 전자정부 프로젝트, 우즈베키스탄

학 번: 2015-22143